

New Toys for Young Children: Integration of Computer Technology into Early Childhood Education

Nesrin ISIKOGLU
Pamukkale Universitesi

ABSTRACT

In recent years there has been a dramatic increase in the availability of computers in educational settings. Since the technology became available for all ages, the amount of technology usage increased in early childhood classrooms (Haugland, 1997). Despite of the dramatic increase of computers in early childhood classrooms, there are still arguments about how to use computers in more effective ways so that children receive maximum educational and developmental benefits. Therefore, the purpose of this study was to examine and to document how teachers used computer technology in their early childhood classrooms. In addition to this question, the sub-questions were: (a) What kinds of technology did teachers use in their classroom? (Computers, software, Internet, multimedia centers) (b) In what kind of activities did teachers use technology? (c) What purposes for technology did teachers report? (c) In what ways did teachers integrate technology into their daily activities? (d) How did teachers facilitate technology usage in their classroom?

This study was completed using the research methods of qualitative inquiry and descriptive case study. Through chain sampling strategy one early childhood education center in Central Pennsylvania area was selected as a participant school in this study. Data were obtained primarily through participant observations, interviews with teachers, and artifact collection. The data analysis consisted of organizing data, coding data, generating categories, themes and patterns, and developing a case.

Analysis of data showed that the teachers struggled to integrate computer technology into their curriculum. The results were focused around three major themes: the purposes of computer integration, the procedures of computer usage, and the improvements that they need in order to better integrate computer technology into their curriculum.

Educational Implications of Computers for Young Children

It is obvious that technology plays a more prevalent role in early childhood education today than previously. The amount of computer use increased dramatically in early childhood classrooms. The potential benefits of computers in early childhood settings are supported by current research (Lomangino, Nicholson, & Sulzby, 1999; Fletcher-Flinn & Suddendorf, 1996; Clements, 1994; Haugland, 1996). Clement (1994) has reported that computers can enhance social interaction, motivation, and attitudes toward learning. Further, increased collaboration enhances and mediates cognitive benefits (Clements, 1994; Lomangino, Nicholson, & Sulzby, 1999). Appropriate use of computers facilities young children's development of academic abilities such as oral language, reading, and writing skills (Clements, 1994). The most powerful benefits of computers are that they foster children's higher level thinking and mathematical abilities such as sorting, counting and numerical recognition (Corning & Halapin, 1989).

Fletcher-Flinn and Suddendorf's (1996) study results show that there is a significant and positive relation between various measures of computer use and metacognition. Having a home computer, having access to a computer (not just occasional experience), or having more frequent encounters with the computer have positive effects on children's metacognitive development. Haugland (1996) argues that computers in early childhood classrooms serve to raise young children's self-esteem, self-concept, and place in the classroom community. She provides examples of specific computer exercises including storytelling, journals, autobiographies, classroom data collection and recording, and classroom activities. She notes that these computer activities enhance self-knowledge and expression.

Challenges of Integration of Computers into Early Childhood Education

One of the foundational assumptions of early childhood education is the belief that young children learn best through play. This assumption was based originally on ideological, philosophical, and pedagogical principles that have their origins in the work of early childhood pioneers such as Froebel, and Montessori. Based on the main structure of early childhood settings that mostly depend on play centered activities how computers should be used is still a controversial issue in the field. Although, a number of studies prove that computers are beneficial for children's learning and development, there is an uncertainty about how to use technology in early childhood settings.

Major arguments about the use of computers in the early childhood field focus on placement of computers, purposes of computer usage, equity of access and appropriate software selections. Shade (1996) argues that schools continue to place computers in isolated labs to practice computer literacy skills. For this reason, he suspects that it is a cheaper way to place computers in a school rather than to place two or three computers in each classroom. He argues that giving teachers adequate numbers of computers in their classrooms

and allowing them to use the computers, as a creative tool across the curriculum areas is a preferable way to use the computers in educational settings instead of placing them in separate labs.

Shade & Watson (1990) state that technology can be misused as any other tool. Adults may encourage inappropriate as well as appropriate uses of computers. Additionally Silvern (1994) argues the purpose of computer usage. He discusses that teachers may use computers as an electronic worksheet and call that activity play. Another example he gives about inappropriate use of technology is when teachers isolate children and arrange for computer interactions solely with machine. He concludes that “rather than using poor technology or using technology poorly, it would be better not to have children using technology at all” (p.534). Shade (1996) states that children are being subject to large dosages of drill-and –practice and the computer is rarely integrated across the curriculum but used instead as a reward for good behavior in class or for remediation (punishment). Therefore, early childhood educators have a responsibility to examine critically the impact of technology on children and be prepared to use technology for the benefit of children.

The other important issue when using computers in early childhood settings is the issue of equity among the users. Research has reported significant differences in male and female attitudes toward computers. Evidence converges on the fact that females have less favorable attitudes toward computers than males (Ogletree & Williams, 1990; Collins, 1985). Although males are consistently observed to have more positive attitudes toward computers than females, this gender gap has shown to be mediated by computer experience (Busch, 1995). Additionally Shade implies the issue of racial equality in computer usage. Minority children are less likely to have access to a personal computer than are middle class European Americans.

The other challenging issue is software selection. A number of researchers recommend that when used with appropriate software and teaching strategies, the computer is a tool that can enhance children’s learning (Wright, 1998). Choosing software from the huge quantity of programs is overwhelming for most teachers. Haugland (1997) has suggested that developmental software that reflects needs and interests of children, open ended, easy to use and updated is preferable for early childhood teachers. On the other hand, the drill-and-practice software still dominates the market place and these have limited educational benefits (Haugland, 1997; Shade, 1996).

Integration of Computers into Curriculum

The National Association for Education of Young Children (NAEYC) the leading association and accreditation organization in the early childhood field, strongly suggest that technology should be integrated into early childhood practice physically, functionally, and philosophically (NAEYC, 1996). They recommend that technology should be integrated into the daily routine of classroom activities. For example, a teacher might introduce musical rhythm with actions, recordings, and a computer used as an electronic rhythm-machine game. Another recommendation, which has been offered by NAEYC, is related to the location of computers in the classroom. As a part of integration, computers should be inside the classroom rather than in a separate computer lab. Additionally, NAEYC suggests that technology can be integrated across subject-matter areas such as in the dramatic play area for preparing signs, and in the math center for recognizing shapes.

NAEYC’s recommendations on computer usage in early childhood settings rarely touch on issues of the Internet and computer games. Silvern’s (1997) suggestion that computer games can play a substantive role in children’s learning and provide many excellent learning opportunities is a modest one, such games are not widely used in classrooms, and there is some doubt that they ever will be. He recommends that computers should be used as a playful instrument and not used as a machine that involves children’s doing drill activities. In terms of the Internet, he strongly recommends the integration of the Internet with teacher supervision.

There are a lot of ways that schools are encouraging children to use technology in their learning. Every classroom has its own guiding philosophies, values, schedules, themes, and activities. Because of that, the integration of technology varies from classroom to classroom. Therefore, a need exists to understand how technology is integrated into various types of early childhood curriculum.

The purpose of this descriptive case study is to examine and to document how teachers used computer technology in their early childhood classrooms. In addition to this question, the sub-questions that were: (a) What kinds of technology did teachers use in their classroom? (Computers, software, Internet, multimedia centers) (b) In what kind of activities did teachers use technology? (c) What purposes for technology did teachers report? (c) In what ways did teachers integrate technology into their daily activities? (d) How did teachers facilitate technology usage in their classroom?

Methodology

The qualitative inquiry methods were chosen to conduct this study as means to describe and understand how computer technology is integrated into the curriculum of early childhood classrooms. Creswell (1998) defined qualitative research as “an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyses

words, reports detailed views of informants, and conducts the study in a natural setting" (p.15). In the present study the research design can perhaps be best defined as a descriptive case study. Merriam (1998) discussed that case study was a particularly suitable design if you were interested in process. Kenny and Grotelueschen (1980) stated that case study was appropriate when the objective of an evaluation was to develop a better understanding of the dynamics of a program. This descriptive case study allows for exploration of the process of teachers' technology usage.

Participants

The purposeful selection of participants was a key element in qualitative research (Creswell, 1998). According to Patton (1990) "the logic and power of purposeful sampling lies in selecting information rich cases for study in depth. Information rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research" (p.169).

Network or chain sampling that obtains knowledge of potential cases from people who know people who meet research interest was used for selecting the participant classroom. As a result of this selection process, one private early childhood classroom in State College, Pennsylvania area agreed to participate in this study. The classroom had 4 female early childhood teachers and approximately 30 children ages from two to five years old.

Data Collection

The primary source of data collection in case studies included multiple sources such as observations, interviews, audio-visual materials, documents and reports (Creswell, 1998). Therefore, this study included interviews with teachers, observations of the program, and collections of document related to curriculum and technology.

The observational record was referred to as field notes – detailed, nonjudgmental, concrete descriptions of what has been observed (Marshall & Rossman, 1999). It allowed researcher to identify the big picture as well as provided important questions for subsequent interviews. For these purposes, the setting was observed two times a week during certain times that the teachers and the researcher agreed upon. Four two-hour long observations were conducted. Three of them were in the morning 8:00 to 10:00, and one was in the afternoon between 2:00 to 4:00.

Another data collection method for this study was interviews. The interview method allowed the researcher to collect large amounts of information quickly and to uncover the participant's views about the topic of study (Marshall & Rossman, 1999). For this study the semi-structured and open-ended interviews with the teachers were conducted. Mainly, the teachers were asked how and why they used technology in their classroom. Two of the interviews were conducted during the naptime while children were sleeping and these interviews were audio typed. Additionally, two other informal interviews were conducted during the observations. Furthermore, the documents related to the center's curriculum and technology usage were collected. These documents were the center's information booklet and pictures of the computers at the center.

Trustworthiness

Creswell (1998) recommended triangulation and member checking techniques for the trustworthiness of the case study. There were different ways to do triangulation such as methods, source and theory triangulation. For this study, three different data collection methods were used (interviews, observations, and documents) in order to provide method triangulation. Furthermore, the participant teachers were asked to examine rough drafts of my study for member checking process.

Data Analysis

The data were analyzed simultaneously with the data collection. This process involved analyzing interviews transcripts, observational field notes and documents. Creswell (1998) described the data analyze for case study as a process of making a detailed description of the case and its settings. Therefore, this study described the classroom and how technology was used in that classroom in detail. The data were interpreted the data through looking for patterns and categories.

Setting of the Study

The study took place at a private daycare program in the central Pennsylvania. Two women founded the program in 1972. Through the years, the program has been continued by the partnership of 3 or 4 women. Currently, four women owned the program, they also taught at the program. The daycare was located in the first floor of an old house with a small backyard. Because of that they arranged the learning centers in different rooms of the house. Although thirty children from two to five years old were currently enrolled, they served with a maximum of 20 children at a time. Four master teachers and interns from Penn State University worked at the center.

The teachers described the program as a child centered and developmentally appropriate curriculum. The central philosophy, stated on their booklet, was that "the child as an inquiring knower who actively

constructs knowledge as s/he interacts with the physical and social environment" (Daycare booklet. p,2). Therefore, they believed that "providing an environment which allows maximum autonomy, within the restraints of safety and group life, is the best way to support children's development" (Daycare booklet. p,2). The daycare's schedule included a half hour teacher directed small groups time, nap, lunch and snack time. For most of the day children were free to choose from a large variety of developmentally appropriate materials and activities. Some of the materials included books, blocks, toys, magic markers, crayons, play dough and computers and the activities were story reading, math and science, music, art, projects and dramatic play.

The computers became a part of the daycare 7 or 8 years ago when they were donated to the program by parents. A new I-Mac computer was donated in the last summer and the number of the computers reached three in the program (Figure 1). The two of the old Macintosh computers were located in the middle room and the new I-Mac computer was located in the other room with an art table and children's cubbies (Figure 1). The children rarely used the old computers.



Figure 1. Location of the Computers

Findings

The investigation focused on the ways the center integrates computer technology into their curriculum. After coding all observations and interviews three major themes were found. As shown Table 1, these themes were purposes, procedures, and improvements of computer technology at the center.

Table 1.
Data Themes

Purposes	Procedures	Improvements
<p>Academic Area</p> <ul style="list-style-type: none"> • Gaining familiarity with computers • Developing math and science skills • Improving reading and writing skills <p>Social Area</p> <ul style="list-style-type: none"> • Improving children's social interaction • Following rules and regularities 	<ul style="list-style-type: none"> • Computers are part of the play • Computers are a tool for learning <p>Teachers' role</p> <ul style="list-style-type: none"> • Facilitator • Trouble shooter 	<ul style="list-style-type: none"> • Technical improvement in hardware and software • Educational improvements

Purposes

Purposes of the daycare center's computer usage indicated two major area, academic and social purposes for computer usage. The responses from both teachers and observation notes pointed that the center's purposes for using computer technology were providing opportunities for children to familiarize with computers, and developing academic skills in science, math, reading and writing. One of the teachers reported:

I guess our purpose is just get them ready, you know familiar with the computers. I guess two year old age,

you know getting them use the mouse...A lot of that (academics) is taught in the programs.. Incorporated in

everything.. Particularly for kids it's teaching math and science.

Both of the teachers were very excited about the way that computers provided learning opportunities for children's social development. The teachers reported that they were using computers in order to increase social interaction among children and adults and to teach the social rules such as turn taking and asking for assistance. One of the teachers stated that:

...If you have two children on the computer, they are going to be talking interacting and so more of a social. We have one little boy all he tends to focus on computers if it's there. You know we try to tend to limit his computer times but it's been a way. He is not very vocal so whenever he's working on the computer with another child you know he is spending time with another child and interacting. And it seems to be another way to them communicate. A lot of times one of the Read America students or one of the teachers will be there and sit with them on the computer. So it just another way for the child get someone on one time with teachers or adults or any other kids.

This description corroborated many of my observations. The little boy, Nick, was trying to interact with other children and teachers while using the computer, although he was not very vocal. As a learning tool computers were used in the center for both academic and social purposes in order to promote children's development as mentioned in the center's philosophy statement.

Procedures

The children primarily used the computers during the free playtime both in the morning and afternoon. Playing with the computers was very popular among boys, ages from 2 to 4. When the children come to the daycare in the morning usually the new I-Mac computer was available for them to play. The teachers stated that;

We use computers right now basically just for the learning center... We haven't really done more. We kept it open on the center. Children choose the program they want to do on it. There are memory games, construction games, they can play with two players or one small group activity.

Although the center used the computers during children's free playtime, the majority of the day was allocated for the free playtime except for the small group, nap and lunch times. As indicated in the mission statement and the teachers' reports, most of the time the children were free to play with the computers. On the other hand, both teachers stated that they did not use the computers in other activities such as story, math, science, art, music or projects.

The teachers had a major role as facilitators who were responsible for providing learning opportunities and selecting developmentally appropriate software for the children. While children were playing with the computer, one of the teachers or interns was usually around the children. They tended to ask questions and stimulate the children's thinking.

The intern asked: "Which ones go to that circle"? She waited for the child's answer. He did not answer. "The ones number 1 on them, right?" The child picked the wrong car again. She said, "He did not want to go there. See the number ones on their flags. They all go to this circle. Look at the numbers on their flags." (Observation notes)

Since this description indicated the computers were used as a tool for the children's learning as much as possible. One teacher commented; "I mean the whole one looked like it has been an interesting at the time period and we are going to have all the matching games thing and then it was basically just driving cars. And then we are retired that one. We just did not see a lot of educational value in it. Any thing like that we put out." The teachers tended to make the computer play a valuable educational experience for children rather than playing solely with the game and having fun with it. The children's learning was the priority for them.

Due to the mixed age of the children enrolled, the needs and development of the children were various at the center. Therefore, the teachers tended to provide the developmentally appropriate learning environment for the children. They reported that the age level children, interactivity of the software, appropriate language and over all educational value were their criteria for the appropriate software. The teachers reported during the informal interviews:

A lot of them (software) is given to us. We haven't bought any of it really... we sit down with the kids and work with it and decide to use it or put it away... If it does not have a lot of interactivity it's kind of

like TV. It should have some educational value and then with the ones like there was a name calling and so negative teach, negative stuff or is not good role modeling. You know we tend to take those off.

Another major role the teachers had was the role of the troubleshooter. This role included setting up the computer, facilitating the turn taking process, and fixing technical problems of the computer.

Often we limited the time they spend. About 15-20 minutes. Depending on. Sometimes you have a line of ten kids waiting for using the computers. In the afternoons they can use a little bit longer because we have less kids in the afternoons... We have two people at the computer. One person is doing the mouse, one person is interacting with the child that child at the computer. And than the person who is using the mouse after 15-20 minutes has to leave and the child who is watching gets to use the mouse. And another child can come in and sit down. Kind of how we have been doing it.

The teachers established a certain schedule to play with computers due to the children's high demand of playing with the computers. These rules also were well accepted by the children.

While two girls playing with the computer, another child came. One of the girls said, "Only two allow to play, go away and play somewhere else." (Observation notes)

When the children wanted to play with the computer, they came to the teacher to set up the computer. It was the teachers' responsibility to turn on the computer and insert the software into the CD-ram. They did not allow children to insert or eject the CD's into the computer. Additionally, when the computer froze for any reason, often the teachers fixed it. Along with these roles, the teachers used the computers for book keeping purposes such as creating a library database and keeping children's records.

Improvements

In order to integrate more computer technology into the center's curriculum, the teachers reported the needs of technical and educational improvements. One teacher reported:

Right now we do not have a printer set up. That's kind of we got one printer but does not always work. And so we haven't able to do a lot with printers... we also do not have a floppy. It doesn't have a CD burner. There is no way we save any thing. We cannot back up any of our files. Makes me a little bit nervous.

Even though the teachers wanted to include computers into their curriculum as much as possible, the lack of technical equipments was a challenge for them. As an independent childcare center they had limited resources. The parents donated all of the computers and the software to them. They were looking for more donations for other equipments such as a printer, external floppy, scanner, and more software for older children.

The educational improvements the teachers reported were opportunities for working in small group computer projects, preparing children's portfolios on the computer, providing various software for girls and older children. One teacher reported:

I have the right age level to be doing stuff on the computer but I have 5 to 7 people on my group every day. Sitting 5 people around the computer it does not make any sense. I am thinking taking my group in the summer... May be taking my group and spending one day on the computer introducing things like encyclopedia.

The teachers had some ideas to use computers more often but they had only one new computer to work on. The teacher's idea of introducing other software to the children showed that they recognized their needs about the issue. However, they could introduce more software to the children even in the large group. Haugland (1997) suggested that children benefited from teacher assistance and support when first exploring the computer. These teacher assistances and supports ensured that all children began to feel confident at the computer. Although they had a good collection of developmentally appropriate software, the children played the same couple of programs all the times I observed. Through introducing children to other programs, they could have had children comfortable to explore various programs.

One of the important issues the teachers recognized was the girls' attitudes toward the computers. They pointed that the boys played with the computers more than the girls. They acknowledged that the number of the boys could be one of the reasons for this difference because the center had more boys than girls. The teacher stated:

Usually boys play with it. A lot of the times girls more interested in playing dressing up... Software does not seem to be appealing to girls. When they try to make it appealing they are doing something with Barbie stuff... It seems to be really younger kids enjoy the computer most right now. Which might because may be we do not have enough older programs or might be our software chooses.

The teachers had expressed their concerns on inequalities on the computer usage. It was also noticeable during the observations. The younger boys (around age 2) preferred to play with the computers more than other

children. As the teachers pointed out the reason could be their lack of software choices for girls and older kids or that the computers were more exciting for younger kids because they were new to them (novelty effect). The placements of the computers and teachers attitudes toward boys and girls were among the reasons for the unequal access between boys and girls (Haugland, 1997; Haugen, 1998; Shade, 1996). Although the teachers recognized the problems, the only solution they suggested was receiving more computer donations from the parents.

Discussions

The findings of this study indicated that computers were used for the purpose of promoting children's social development and improving their academic skills. The children often used the computers during the free play times. Rather than letting the children play alone with the machine, the teachers encouraged children to play in pairs and stimulate their learning by asking questions. Although they provided developmentally appropriate software for the children, the interest of the older children and particularly the interest of girls were very low.

Moreover, the findings suggested that the center needed a lot of improvements in order to incorporate computer technology into their curriculum. Although the technical and educational improvements were recognized by the teachers the suggested solutions were very limited. One of the teachers noted:

I guess, we are all learning too. You know some of us still scared of computers... It is very new especially the Internet. I graduated college from 3 years ago. We weren't doing anything on the Internet. You know it is just coming around now. I think that if we get a little bit more for it we will be able to do more with it. So learning, I mean it really is.

As she pointed that the computer technology were improving very fast, the teachers also needed to learn and sustain the new developments. Additionally, relying only on the donations for the resources kept them undeveloped. They could look for the additional resources. For example, local libraries or parents could loan software. They could ask for demo disk or preview software from the educational software companies. They could buy used materials. Some of the resources such as digital camera or scanner can be bought under \$100. The integration of the computers requires a lot of teacher work and commitment.

The findings lead to two suggestions for how the integration of computer technology can be enhanced. First, the needs of improvements in technical and educational levels reveal the essential need for the teacher training on the issue. Although the teachers recognize their limitations they are not aware of possible solutions. Further research can be done on how early childhood teachers find resources and supports on technology. Second, the overwhelming interest of young boys on computers should be researched further. The issue of how young children should start using computers is subject of recent debates (Elkind, 1998). The software, called *lapware* for infants and toddlers from six months to two years, is available. The further research is needed to understand the possible benefits or danger of using computers at this early age.

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